



**INTERNATIONAL PRELIMINARY EXAMINATION REPORT**  
(PCT Article 36 and Rule 70)

Applicant's or agent's file reference 702749 PCT	<b>FOR FURTHER ACTION</b> See Notification of Transmittal of International Preliminary Examination Report (Form PCT/PEA/416)	
International application No. PCT/CA 03/01486	International filing date (day/month/year) 29.09.2003	Priority date (day/month/year) 27.09.2002
International Patent Classification (IPC) or both national classification and IPC B21D53/28		
Applicant TESMA INTERNATIONAL INC. et al.		
<p>1. This international preliminary examination report has been prepared by this International Preliminary Examining Authority and is transmitted to the applicant according to Article 36.</p> <p>2. This REPORT consists of a total of 4 sheets, including this cover sheet.</p> <p><input checked="" type="checkbox"/> This report is also accompanied by ANNEXES, i.e. sheets of the description, claims and/or drawings which have been amended and are the basis for this report and/or sheets containing rectifications made before this Authority (see Rule 70.16 and Section 607 of the Administrative Instructions under the PCT).</p> <p>These annexes consist of a total of 2 sheets.</p>		
<p>3. This report contains indications relating to the following items:</p> <p>I <input checked="" type="checkbox"/> Basis of the opinion</p> <p>II <input type="checkbox"/> Priority</p> <p>III <input type="checkbox"/> Non-establishment of opinion with regard to novelty, inventive step and industrial applicability</p> <p>IV <input type="checkbox"/> Lack of unity of invention</p> <p>V <input checked="" type="checkbox"/> Reasoned statement under Rule 66.2(a)(ii) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement</p> <p>VI <input type="checkbox"/> Certain documents cited</p> <p>VII <input type="checkbox"/> Certain defects in the international application</p> <p>VIII <input type="checkbox"/> Certain observations on the international application</p>		
Date of submission of the demand  15.04.2004	Date of completion of this report  16.12.2004	
Name and mailing address of the international preliminary examining authority:   European Patent Office D-80298 Munich Tel. +49 89 2399 - 0 Tx: 523656 epmu d Fax: +49 89 2399 - 4465	Authorized Officer  Meritano, L  Telephone No. +49 89 2399-7311  	

**INTERNATIONAL PRELIMINARY  
EXAMINATION REPORT**

International application No. **PCT/CA 03/01486**

**I. Basis of the report**

1. With regard to the **elements** of the international application (*Replacement sheets which have been furnished to the receiving Office in response to an invitation under Article 14 are referred to in this report as "originally filed" and are not annexed to this report since they do not contain amendments (Rules 70.16 and 70.17)*):

**Description, Pages**

1-7 as originally filed

**Claims, Numbers**

1-12 filed with telefax on 19.10.2004

**Drawings, Sheets**

1/3-3/3 as originally filed

2. With regard to the **language**, all the elements marked above were available or furnished to this Authority in the language in which the international application was filed, unless otherwise indicated under this item.

These elements were available or furnished to this Authority in the following language: , which is:

- ☐ the language of a translation furnished for the purposes of the international search (under Rule 23.1(b)).
- ☐ the language of publication of the international application (under Rule 48.3(b)).
- ☐ the language of a translation furnished for the purposes of international preliminary examination (under Rule 55.2 and/or 55.3).

3. With regard to any **nucleotide and/or amino acid sequence** disclosed in the international application, the international preliminary examination was carried out on the basis of the sequence listing:

- ☐ contained in the international application in written form.
- ☐ filed together with the international application in computer readable form.
- ☐ furnished subsequently to this Authority in written form.
- ☐ furnished subsequently to this Authority in computer readable form.
- ☐ The statement that the subsequently furnished written sequence listing does not go beyond the disclosure in the international application as filed has been furnished.
- ☐ The statement that the information recorded in computer readable form is identical to the written sequence listing has been furnished.

4. The amendments have resulted in the cancellation of:

- ☐ the description, pages:
- ☐ the claims, Nos.:
- ☐ the drawings, sheets:

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5. ☐ This report has been established as if (some of) the amendments had not been made, since they have been considered to go beyond the disclosure as filed (Rule 70.2(c)).

*(Any replacement sheet containing such amendments must be referred to under item 1 and annexed to this report.)*

6. Additional observations, if necessary:

**V. Reasoned statement under Article 35(2) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement**

**1. Statement**

Novelty (N)	Yes: Claims	1-12
	No: Claims	
Inventive step (IS)	Yes: Claims	1-12
	No: Claims	
Industrial applicability (IA)	Yes: Claims	1-12
	No: Claims	

**2. Citations and explanations**

**see separate sheet**

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International application No. PCT/CA 03/01486

1. The subject-matter of claim 1 fulfils the requirements of Art. 33 PCT for the following reasons.

The closest prior art is considered to be a known method of forming a differential housing comprising an outer housing and a separate ring gear (see **EP-A-0979959 (D2)**).

The aim of the invention is to simplify the method by reducing the number of forming and machining operations.

The problem is solved by (a) providing a housing blank having an annular rim and (b) with the blank supported by a rotating tool, forming teeth on the annular rim.

The available prior art discloses also differential housings comprising an integral ring gear: see **JP-A-62132055 (D1)**, **GB-A-786593 (D3)**. However, these documents are silent about the production method. **D1** mentions merely the provision of a forged integral housing; it is to suppose that this forged housing either comprises a ring which thereafter is machined by a common gear-cutting machine or an already forged toothed ring. **D3** does not say anything about a manufacturing method. Therefore, the available literature does not give any hint to the skilled person to arrive at the claimed method.

2. Claims 2 to 12 are dependent on claim 1 and as such fulfil the requirements of Art. 33 PCT.

What is claimed is:

1. A method of making a differential housing having a ring gear integrally formed therein, said method comprising the steps of:  
providing a housing blank having an annular rim;  
supporting the housing blank in a rotatable holding tool so that the annular rim extends radially outwardly from the holding tool for rotation therewith;  
rotating the holding tool; and  
applying a gear forming tool for engaging the annular rim during rotation of the holding tool, whereby a plurality of teeth are formed along the annular rim to form the ring gear.
2. The method of making a differential housing of claim 1 further including the step of applying a first thickening tool for engaging the annular rim during rotation of the holding tool wherein the annular rim is plastically deformed to form a lip.
3. The method of making a differential housing of claim 2 wherein the thickening tool rotates in an opposite direction relative to the holding tool.
4. The method of making a differential housing of claim 2 further including applying additional thickening tools to plastically deform the annular rim to a desired lip dimension.
5. The method of making a differential housing of claim 2 wherein the first thickening tool is displaced towards the holding tool for deforming the annular rim.
6. The method of making a differential housing of claim 1 wherein the annular rim is preformed prior to providing the housing blank.

7. The method of making a differential housing of claim 1 further including the step of flow forming the housing blank to form the annular rim prior to supporting the housing blank in the rotatable holding tool.

8. The method of making a differential housing of claim 7 wherein the flow forming step comprises the steps of:

providing lower and upper dies having pre-shaped surfaces, the upper die moveable relative to the lower die;

introducing the housing blank onto the lower die and moving the upper die to compress the blank within a cavity defined by the upper and lower die pre-shaped surfaces wherein an annular rim is formed.

9. The method of making a differential housing of claim 1 wherein the gear forming tool is rotating in an opposite direction relative to the holding tool.

10. The method of making a differential housing of claim 1 wherein the gear forming tool is displaced towards the holding tool for forming the plurality of teeth.

11. The method of making a differential housing of claim 2 wherein first and second rotatable holding tools are utilized successively to hold the housing blank for the step of applying the thickening tool and the step of applying the gear forming tool.

12. The method of making a differential housing of claim 1 further including the step of removing material from the annular rim prior to the step of applying the gear forming tool.